

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 0000055116	FOR FURTHER ACTION		See item 4 below
International application No. PCT/EP2004/013560	International filing date (<i>day/month/year</i>) 30 November 2004 (30.11.2004)	Priority date (<i>day/month/year</i>) 02 December 2003 (02.12.2003)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant BASF Aktiengesellschaft			

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).
2. This REPORT consists of a total of 10 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.
3. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input checked="" type="checkbox"/>	Box No. II	Priority
<input checked="" type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application
4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 740 14 35	Date of issuance of this report 07 June 2006 (07.06.2006) Authorized officer <div style="text-align: center; font-weight: bold;">Agnes Wittmann-Regis</div> Telephone No. +41 22 338 89 70
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PATENT COOPERATION TREATY

REC'D 16 MAR 2005

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From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2004/013560

International filing date (day/month/year)
30.11.2004

Priority date (day/month/year)
02.12.2003

International Patent Classification (IPC) or both national classification and IPC
C12N9/10

Applicant
BASF AKTIENGESELLSCHAFT

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/013560

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☒ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☒ in written format
☒ in computer readable form
 - c. time of filing/furnishing:
☒ contained in the international application as filed.
☒ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/013560

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. ☐ It has not been possible to consider the validity of the priority claim because a copy of the priority document was not available to the ISA at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/013560

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 21 and 22 (partially)

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the whole application or for said claims Nos. 21 and 22 (partially)
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
 - the written form ☐ has not been furnished
 - ☐ does not comply with the standard
 - the computer readable form ☐ has not been furnished
 - ☐ does not comply with the standard
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☐ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/013560

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-4, 10-28
	No: Claims	5-9
Inventive step (IS)	Yes: Claims	
	No: Claims	1-28
Industrial applicability (IA)	Yes: Claims	1-28
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. The present application refers to the use of a plant 2-methyl-6-solanylbenzoquinone methyl transferase / 2-methyl-6-phytylbenzoquinone methyltransferase for the identification of herbicides.
2. Reference is made to the following documents :
 - D1: CHENG ZIGANG ET AL: "Highly divergent methyltransferases catalyze a conserved reaction in tocopherol and plastoquinone synthesis in cyanobacteria and photosynthetic eukaryotes." PLANT CELL, vol. 15, no. 10, October 2003 (2003-10), pages 2343-2356.
 - D2: MOTOHASHI REIKO ET AL: "Functional analysis of the 37 kDa inner envelope membrane polypeptide in chloroplast biogenesis using a Ds-tagged Arabidopsis pale-green mutant." PLANT JOURNAL, vol. 34, no. 5, June 2003 (2003-06), pages 719-731.
 - D3: ABELL ET AL: "biochemical approaches to herbicide discovery: advances in enzyme target identification and inhibitor design" WEED SCIENCE, WEED SCIENCE SOCIETY OF AMERICA, CHAMPAIGN, IL, US, vol. 44, 1996, pages 734-742.
 - D4: WO 01/04330 A (SUNGENE GMBH & CO. KGAA; HERBERS, KARIN; BADUR, RALF; KUNZE, IRENE; GE) 18 January 2001 (2001-01-18)
 - D5: DATABASE EMBL APG1 Arabidopsis thaliana 1 December 2001 (2001-12-01), MOTOHASHI ET AL.: retrieved from EBI accession no. Q94IE2
 - D6: DATABASE EMBL 37kDa chloroplast inner membrane polypeptide 1 November 1996 (1996-11-01), BLOCK ET AL.: retrieved from EBI accession no. Q40501
 - D7: DATABASE EMBL N. tabacum mRNA for 37 kDa protein 30 June 1996 (1996-06-30), BLOCK ET AL.: retrieved from EBI accession no. X94968
 - D8: DATABASE EMBL A. thaliana mRNA for APG1 17 July 2001 (2001-07-17), MOTOHASHI ET AL.: retrieved from EBI accession no. AB054257

3. Lack of novelty; article 33(2) PCT.

- 3.1 Due to the clarity problem mentioned in point VIII-4 below, the subject-matter of claims 5-8 cannot be considered as novel over the teaching of D1, D2 and D8 (article 33(2) PCT).
- 3.2 Due to the clarity problem mentioned in point VIII-6 below, at least each transgenic *Arabidopsis thaliana* fit the definition of claim 9. Numerous transgenic *A. thaliana* plants have already been disclosed. Therefore, the subject-matter of claim 9 cannot be considered as novel in the sense of article 33(2) PCT.

4. Lack of inventive step; article 33(3) PCT

The documents D1 and D2 which have been cited in the description of the present application disclose *Arabidopsis thaliana* and tobacco mutants in the gene coding for the 2-methyl-6-solanylbenzoquinone methyl transferase (MSBQ-MT) / 2-methyl-6-phytylbenzoquinone methyltransferase (MPBQ-MT). Said mutants show an albino / pale green phenotype and do not survive beyond the seedling stage when germinated on soil. D1 and D2 don't disclose the use of the MSBQ-MT / MPBQ-MT enzyme as a target for herbicides.

However, the 2-methyl-6-solanylbenzoquinone methyltransferase / 2-methyl-6-phytylbenzoquinone methyltransferase disclosed in said documents, which appears to be a key enzyme for plant growth, fulfil the requirements of a target for herbicides as set in D3.

Moreover, the document D4, which discloses a *Synechocystis* 2-methyl-6-phytylbenzoquinone methyltransferase, refers to said enzyme as a potential target for herbicides (p. 13, line 40 to p. 14, line 21). Even if the *Synechocystis* and plant enzymes don't share significant sequence similarities, the plant and *Synechocystis* enzymes are functional equivalents (D1 : p. 2345, right-hand column, lines 1-5).

Therefore, the skilled person, knowing from D1 and D2 that plants mutated in the

gene coding for MSBQ-MT / MPBQ-MT cannot survive beyond seedling stage (indicating that the corresponding enzyme would be good targets for herbicides) and knowing from D4 that MPBQ-MT represent a potential target for herbicides, would have needed no inventive skill to consider using the Arabidopsis or Nicotiana enzymes (see D5-D8 for the sequences) as target for herbicides.

Therefore, the subject-matter of claims 1-28 cannot be considered as inventive as far as the use of a plant MSBQ-MT / MPBQ-MT, or fragments thereof as target for herbicides is concerned.

The claims also refer to the use of a truncated form of the enzyme. The effect of the truncated form is to obtain an improved expression in Escherichia coli for use in an efficient high throughput screening. However, most of the claims of the present application are not restricted to such a context. Moreover, the host cell are not restricted to Escherichia coli cells. Therefore, no inventive activity can be recognized for the use of truncated forms of the protein in general methods for identifying herbicides.

Re Item VIII

Certain observations on the international application

Lack of clarity; article 6 PCT.

1. In claim 2 (iii), it is not clear what a functional equivalent of a nucleic acid sequence should be (which function from the nucleic acid is meant ?).

This remark also applies to claims 3, 5, 11-12, 25 and 27.

2. In claim 3, it is not clear with reference to what the amino acid sequence should be truncated what renders the scope of the claim unclear.

This remark also applies to claims 5, 11-12, 25 and 27.

3. Claim 4 refers to the use of a truncated 2-methyl-6-solanylbenzoquinone

methyltransferase and refers to claims 1-3. Only claim 3 refers to the use of a truncated enzyme. Therefore, the dependency of claim 4 should be checked.

4. The attention of the applicant is drawn to the fact that the well-known nucleic acid sequences encoding the full length MSBQ-MT (D7 and D8) **comprise** the nucleic acid sequences shown in SEQ ID NO:5 or SEQ ID NO:7 or **comprise** nucleic acid sequences which can be derived by back translation of the amino acid sequences shown in SEQ ID NO:6 or SEQ ID NO:8.

This remark applies to all the claims referring to the nucleic acids.

5. The wording of claim 7 encompasses an expression cassette comprising (undefined) functional elements alone. Expression cassettes comprising "functional elements" are already known in the art.
6. Claim 9 refers to a non human transgenic organism comprising at least one nucleic acid according to claim 5. Each Arabidopsis cell naturally comprise the sequence set forth in SEQ ID NO:5 or SEQ ID NO:7. Therefore, each transgenic Arabidopsis will fit the definition of claim 9, whatever the transgene is.
7. Claim 10 refers to a method for identifying a herbicidally active substance comprising (ii) testing whether the test compound binds to the polypeptide with the activity of a 2-methyl-6-solanylbenzoquinone methyltransferase. The Search Authority is of the opinion that each compound binding the 2-methyl-6-solanylbenzoquinone methyltransferase will not necessarily have herbicidal activity.
8. The herbicidally active compound of claim 21 and the compound with growth regulatory activity of claim 22 are not characterized by any technical feature and cannot, therefore, be the subject of a meaningful examination.